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Post-Wildfire Surface Material Mapping Using Hyperspectral Data, Station Fire, Southern California, USA

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The Station Fire started on August 26, 2009, just outside Los Angeles, California, USA. By the time the fire was contained on October 16, 2009, it had burned an area of ∼650 km2. Southern California wildland fires of this type leave behind a broad array of surface cover types that include the various types of ash, charred vegetation, partially burned vegetation, green vegetation, and exposed soil and rock. Maps of the distributions of these materials can play an important role in our understanding of post-fire erosion potential, slope failure and vegetation regrowth, as well as defining areas of environmental concern. On October 6, 2009, NASA's Airborne Visible and Infrared Imaging Spectrometer (AVIRIS) collected imaging spectrometer data as part of an instrument calibration stability investigation covering the burn area of the Station Fire. This paper reports on the mapping results and the use of these data to define areas vulnerable to post-fire erosion and slope failure.

The AVIRIS data consist of 224 contiguous ∼10nm spectral channels between the wavelengths of 0.36 and 2.50 microns. The spatial sampling for this dataset was ∼10 m. AVIRIS data were converted to reflectance using ground-calibration measurements and radiative transfer software. Ash and soil samples were collected from within the burn perimeter, and their spectra were measured in the laboratory. These spectra were added into a spectral library, which included spectra of minerals and vegetation. Using spectral feature comparisons, surface material maps were generated based on the unique spectral characteristics of each material. The resulting maps show the distribution of ash/char and its relative abundance, green and partially burned vegetation cover, and the mineral composition of exposed soil and rock areas. We are integrating this information with digital elevation models, and other spatial data, to define areas vulnerable to erosion and slope-failure. We are also linking the spectral data to the ash and soil chemistry and other datasets to define areas of environmental concern for humans and wildlife. The maps extend plot-based knowledge of the fire's effects on soils to the wider landscape, thereby increasing our understanding of post-fire hydrologic and ecosystem processes.